13:46:18 OCA PAD INITIATION - PROJECT HEADER INFORMATION 07/17/91

Active

Project #: G-33-A16 Cost share #: G-33-A15 Rev #: 0
Center # : 10/24-6-Q5250-6A0 Center shr #: OCA file #:
Work type : RES
Contract#: 5 R01 EY01746-16 Mod #: Document : GRANT
Prime #: Contract entity: GIT

Subprojects ? : N CFDA: 93.868
Main project #: PE #: N/A

Project unit: CHEMISTRY Unit code: 02.010.136
Project director(s):
YU N-T CHEMISTRY (404)894-4007

Sponsor/division names: DHHS/PHS/NIH / NATL INSTITUTES OF HEALTH
Sponsor/division codes: 108 / 001

Award period: 910501 to 920430 (performance) 920731 (reports)

Sponsor amount	New this change	Total to date
Contract value	244,537.00	244,537.00
Funded	244,537.00	244,537.00
Cost sharing amount		0.00

Does subcontracting plan apply ?: N

Title: COMPARATIVE RAMAN STUDIES OF HUMAN AND ANIMAL LENSES

PROJECT ADMINISTRATION DATA

OCA contact: Kathleen R. Ehlinger 894-4820

Sponsor technical contact

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EXTRAMURAL SERVICES BRANCH
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9000 ROCKVILLE PIKE
BETHESDA, MD. 20892

Security class (U,C,S,TS) : U ONR resident rep. is ACO (Y/N): N
Defense priority rating : N/A NIH supplemental sheet
Equipment title vests with: Sponsor GIT X

Administrative comments -
INITIATION OF PROJECT. CONTINUATION OF G-33-A15.

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

NOTICE OF PROJECT CLOSEOUT

Closeout Notice Date 09/08/92

Project No. G-33-A16_____ Center No. 10/24-6-Q5250-6A0_

Project Director YU N-T_____ School/Lab CHEMISTRY_____

Sponsor DHHS/PHS/NIH/NATL INSTITUTES OF HEALTH_____

Contract/Grant No. 5 R01 EY01746-16_____ Contract Entity GIT_

Prime Contract No. _____

Title COMPARATIVE RAMAN STUDIES OF HUMAN AND ANIMAL LENSES_____

Effective Completion Date 920430 (Performance) 920731 (Reports)

Closeout Actions Required:	Y/N	Date Submitted
Final Invoice or Copy of Final Invoice	N	_____
Final Report of Inventions and/or Subcontracts	N	_____
Government Property Inventory & Related Certificate	N	_____
Classified Material Certificate	N	_____
Release and Assignment	N	_____
Other _____	N	_____

CommentsCONTINUED BY G-33-A17; ALL CLOSING DOCUMENTS WILL BE SUBMITTED AT THE END OF THE GRANT._____

Subproject Under Main Project No. _____

Continues Project No. G-33-A15_____

Distribution Required:

Project Director	Y
Administrative Network Representative	Y
GTRI Accounting/Grants and Contracts	Y
Procurement/Supply Services	Y
Research Property Managment	Y
Research Security Services	N
Reports Coordinator (OCA)	N
GTRC	N
Project File	Y
Other _____	N
_____	N

G 33-A16

SECTION IV PROGRESS REPORT SUMMARY	GRANT NUMBER EY01746-17	
PRINCIPAL INVESTIGATOR OR PROGRAM DIRECTOR Yu, Nai-Teng	PERIOD COVERED BY THIS REPORT FROM	THROUGH
APPLICANT ORGANIZATION Georgia Institute of Technology	05/01/91	02/17/92

TITLE OF PROJECT *(Repeat title shown in item 1 on first page)*
Comparative Raman Studies of Human and Animal Lenses
(SEE INSTRUCTIONS)

1. The Plans for the Next Year of Support:

The specific aims for the next year of support are : (1) To continue the study of UV-induced fluorescence distribution profiles of guinea pig lens by long-term in vivo UV exposture; (2) To employ the new Macintosh II data collection system for continuing investigation of fluorophores/chemical group distributions in human and animal lenses; (3) To study i) Schiff-base adducts from cross-linking of carbonyl groups of malondialdehyde (MDA) with the reactive amino groups of phospholipids, and ii) browning products from nonenzymatic glycosylation of lens crystallins; and (4) To apply the precision difference FT-Raman technique to detect subtle structural changes of lens crystallins upon oxidation and in the presence of calcium ion; (5) To study the intact lens that has been glutathione-depleted by 1-chloro-2,4-dinitrobenzene.

2. Concise Description of the Studies Conducted during the Current Budget Year:

a) UV-Blocking Contact Lens: Protection of Eye Lens from UV-Induced Damage

We have examined the efficacy of a UV-absorbing contact lens in reducing UV-induced damage to the guinea pig lens *in vivo*. Each of the animals was fitted with a UV-blocking hydrogel contact lens, possessing a monolayer of UV-absorbing chromophore, on the control eye and a regular hydrogel contact lens on the contralateral eye. After 12-19 months of continuous exposure to UV from a blacklight source, the unprotected lens showed increased (a) opacification, (b) pigmentation, (c) fluorescence, and (d) disulfide formation. Such changes also occur in human lenses during cataractogenesis. Therefore, our study strongly supports the

idea that increased exposure to UV light is an important factor in human cataract formation.

b) ***Glycogen Granules in the Lens of Dove and Pigeon Studied by Electron Microscopy and Raman Spectroscopy***

Electron microscopy confirms the presence of a high concentration of glycogen particles in the lens nuclear region of birds of flying habit such as the ring-neck dove and pigeon lens. This observation is consistent with Raman spectroscopy. The glycogen granules in the dove lens, which are approximately 35 nm in diameter, are classified as beta type granules. Although this type has been previously characterized by high rates of glycogen turnover in other tissues, its localization in the lens nucleus indicates that it may serve a structural function rather than as a storage depot of carbohydrate in the lens. In a comparative electron microscopy study, glycogen granules were not observed in the chicken lens.

c) ***Study of a Transient Glycogen Cataract in the Pigeon Lens***

We observed for the first time that during the first two weeks after hatching young pigeons show a dense nuclear cataract. Transmission electron microscopy revealed that the lens opacity was specifically associated with extensive accumulation of glycogen aggregates in the nuclear fiber cells. These aggregates of various sizes were composed of individual 35-nm beta glycogen particles. In contrast, glycogen aggregates were not seen in transparent lenses at the age of three weeks and older, at which time only an homogeneous distribution of individual glycogen particles at a high concentration was present in the entire cytoplasm of nuclear fiber cells. Our result shows that the altricial pigeon is born with a transient cataract associated with an accumulation of glycogen aggregates in the nuclear fiber cells.

3. No change

4. Not Applicable

5. **Publications:**

i) Yu, N.-T., Cai, M.-Z., Lee, B. S., Kuck, J. F. R., Jr., McFall-Ngai, M., and Horwitz, J. (1991) "Resonance Raman Detection of a Cartenoid in the Lens of the Deep-Sea Hatchetfish" **Exp. Eye Res.** *52*, 475-479.

ii) Chen, Wenlung, Nie, S., Kuck, J. F. R., Jr. and Yu, N.-T. (1991) "Near-IR Fourier Transform Raman and Conventional Raman Studies of Calf γ-Crystallins in the Lyophilized State and in Solution" **Biophys. J.** *60*, 447-455.

iii) Zigman, S., Paxhia, T., McDaniel, T., Lou, M. F. and Yu, N.-T. (1991) "Effect of Chronic Near-Ultraviolet Radiation on the Gray Squirrel Lens *in Vivo*" **Invest. Ophthalmol. Vis. Sci.**, *32*, 1723-1732.

iv) Sokolov, K. V., Lutsenko, S. V., Nabiev, I. R., Nie, S. and Yu, N.-T. (1991) "Surface-enhanced Raman Analysis of Biomedical Eye Lens Extracts" **Applied Spectrosc.** *45*, 1143-1148.

v) Bergbauer, K. L., Kuck, J. F. R., Jr., Su, K. and Yu, N.-T. (1991) "Use of a UV-Blocking Contact Lens in Evaluation of UV-Induced Damage to the Guinea Pig Lens" **Int. Contact Lens Clinic**, *18*, 182-187.

vi) Castillo, C. G., Lo, W.-K., Kuck, J. F. R., Jr. and Yu, N.-T. (1992) "Nature and Localization of Avian Lens Glycogen by Electron Microscopy and Raman Spectroscopy" **Biophys. J.** (in press)

vii) Lo, W.-K., Kuck, J. F. R., Jr., Shaw, A. P. and Yu, N.-T. (1992) "Are Altricial Birds Born Blind with a Transient Glycogen Cataract ?" (to be submitted).